

PDR 71-9009

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Westinghouse Electric Corporation

Power Systems

Nuclear Fuel Division

U.S. NUCLEAR REG. COMMISSION
MAIL SECTION

Box 355
Pittsburgh Pennsylvania 15230
PFDL-79-339

Mr. William J. Dircks, Director
Nuclear Material Safety and Safeguards
United States Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Dircks:

Subject: Plutonium Oxide Shipment

Reference: Code of Federal Regulations, Title 10, Part 71.61 - Reports

In compliance to the requirements specified in the referenced document, Westinghouse Nuclear Fuel Division is herewith submitting a preliminary report related to a shipment of plutonium oxide from Westinghouse Plutonium Fuels Development Laboratory (PFDL) to the DuPont Savannah River Plant which originated on October 10, 1979. The information submitted in this report substantiates the telephone conversations on October 27, and subsequent dates, among Messrs. J. J. Bastin, Manager, PFDL, R. Odegaarden, NRC Transportation Branch, and W. Kinney, NRC Region I.

If you have any questions on this matter, please contact me.

Sincerely yours,

WESTINGHOUSE ELECTRIC CORPORATION

J S Moore
J. S. Moore, General Manager
Nuclear Fuel Division

JJB/pmc

Attachment

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cc: Mr. G. Smith, NRC Region I
Mr. C. E. Anthony, General Manager, EMD
Mr. J. J. Bastin, Manager, PFDL
Mr. R. P. DiPiazza, NES License Administrator

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I. DETAILS OF SHIPMENT

- A. Type of Material: PuO_2 powder.
- B. Total Quantity Transferred: 11,966 grams of Pu contained in 14,027 grams of PuO_2 .
- C. Transferred to: DuPont Savannah River Plant (SRP).
- D. Transfer Dates: Shipped from PFDL October 10, 1979. Received at SRP October 11, 1979.
- E. Type of Shipping Container: FL-10-1 (see Sketch No. 1, attached).
- F. Total Number of Shipping Containers: 4.
- G. Regulatory Requirements: NRC Certificate of Compliance No. 9009, Rev. 3; 10 CFR Part 71.

II. METHOD OF PACKAGING

The PuO_2 powder was packaged per PFDL Operating Procedure No. PFDL-OP-0212. The sequence of operations was:

- A. Transfer the PuO_2 powder from vault storage to a low humidity glove box.

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- B. Transfer the PuO_2 powder from the storage container to paint cans. Determine the net weight for each.
- C. Apply a tamper safe seal to the paint can.
- D. Bag the paint can out of the glove box and enclose in a second layer of plastic.
- E. Place the double-bagged paint can in a crimp-sealed food can.
- F. Load the powder-filled food cans into an inner canister with a bottom end plate welded in place using empty food cans and aluminum spacers to complete the stack.
- G. Weld the top end plate onto the inner canister.
- H. Flush the inner canister with helium through the purge holes in each end plate.
- I. Plug the purge holes with filler wire and seal weld.
- J. Transfer the inner canister into the pressure chamber of a FL-10-1 shipping container.
- K. Evacuate and leak test using a helium mass spectrometer.

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- L. Pressurize the FL-10-1 pressure chamber with helium and verify the integrity of the O-ring seals with a sniffer probe connected to a helium mass spectrometer.
- M. Vent the FL-10-1 pressure chamber to atmospheric pressure and complete the assembly of the shipping container.
- N. Tamper safe the FL-10-1 shipping container and hold in storage for the shipment.
- O. Transfer the FL-10-1 shipping container to the transport vehicle and secure for the shipment.

Table 1 and Figures 1 through 4 describe the contents and loading patterns of each FL-10-1 shipping container.

III. RECEIPT OF MATERIAL AT SRP

The shipping containers were received at SRP on October 11, 1979.

Shipping Containers No. RL088, RL067, and RL061 were unloaded on October 15 and 16, 1979. Shipping Container No. RL070 was unloaded on October 25, during which SRP personnel experienced problems. Following is as much information as is currently available relative to the unloading operations at SRP:

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A. Unloading Procedure

1. Unload the inner canister from the FL-10-1 shipping container and transfer to a "hut" (plastic tent).
2. Place the inner canister in a horizontal position in a cradle-type fixture.
3. Using a pipe cutter, cut through the wall of the inner canister.
4. Remove the food cans from the inner canister and transfer them to storage.

B. Unloading Schedule

1. The inner canister from shipping containers RL088, RL067, and RL061 were unloaded per the above procedure without any problems.
2. While proceeding through Step. A.3, above, with the inner canister from shipping container RL070, the following series of events occurred:
 - a. After completing the cut through the inner canister, the pipe section fell to the floor. The cut was made approximately 3" from the bottom.

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- b. Three empty food cans in the bottom of the inner canister "ejected" and fell to the floor.
- c. Personnel observed a "puff of smoke."
- d. The continuous air monitor outside the hut alarmed.
- e. Personnel outside the hut evacuated the room.
- f. Contamination was detected in the hut and the room.
- g. Special procedures were developed to decontaminate the area and complete the unloading operations.
- h. Cleanup and unloading operations were completed by October 31, 1979.

C. Conditions Observed by SRP Personnel

SRP personnel transmitted the following information relative to the conditions of the food cans in the inner canister:

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<u>Can Position From Bottom of Canister</u>	<u>Can Contents</u>	<u>Can Condition As Removed From Canister</u>
1	Empty	Swollen at Both Ends
2	Empty	Swollen at Both Ends
3	Empty	Swollen at Both Ends
4	Product	Swollen at Both Ends
5	Product	Swollen at Both Ends
6	Product	Breached at One End
7	Product	Swollen at Both Ends
8	Product	Normal - No apparent deformation
9	Empty	Swollen at Both Ends
10	Empty	Crushed

IV. INVESTIGATION AT SRP

SRP personnel are currently conducting an investigation of the problems that were encountered during the unloading operations. Their plan is to issue a "Special Hazards Report" by the week of November 19.

Westinghouse personnel plan to review the findings with SRP personnel.

Thus far, SRP personnel have initiated the following actions:

- A. Isotopic, impurity, and loss on ignition analyses of the PuO₂ in Can #3 and Can #2.

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- B. Analyses of the atmospheres found in the bloated plastic bag of Can #2 and Can #1 and in one of the empty spacer cans.
- C. Dye penetrant and metallographic evaluation of the inner canister welds.
- D. Scanning electron microscopy of the cut surfaces of the inner canister.

At this time, the results of destructive and nondestructive tests are not available. They will be reviewed and discussed with the NRC at a later date.

V. INVESTIGATION BY WESTINGHOUSE PERSONNEL

The following actions were initiated by Westinghouse personnel:

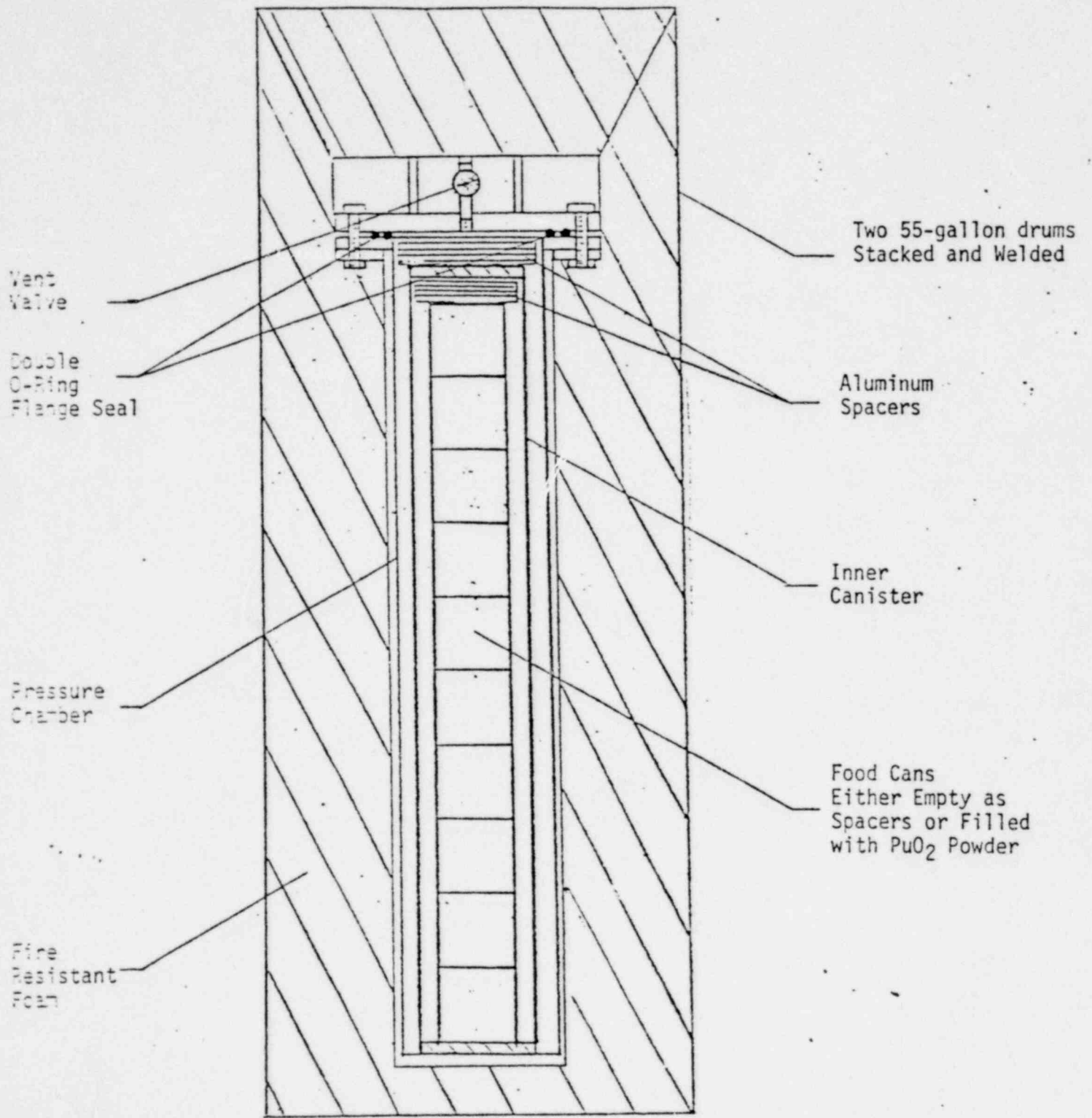
- A. Verification of the decay heat load calculations.
- B. Heat transfer analyses to determine temperatures experienced by various parts of the package during shipment.
- C. Mechanical compression tests of food cans using axial end loading.
- D. Pneumatic pressure tests of food cans and paint cans to determine mechanical behavior under a variety of conditions.

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E. Identification of coating and gasket materials found on the inside surfaces of food cans used for shipping container RL070. Also, evaluation of the thermal stability of these same materials.

After completion of this investigation, a report will be issued for review by the NRC.

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SKETCH 1

CROSS SECTION OF THE FL-10-1 SHIPPING CONTAINER

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TABLE 1

CONTENTS OF FL-10-1 SHIPPING CONTAINERS

FL-10-1 Serial Number	RL088	RL067	RL061	RL070
Inner Canister Serial Number	3	4	5	6
Total Weight PuO ₂ (Grams)	3,200	3,300	2,823	4,704
Total Weight Pu (Grams)	2,736	2,831	2,414	3,995
Total Decay Heat (Watts)	28.5	29.2	25.1	10.5

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FIGURE 1

INNER CANISTER LOADING PATTERN

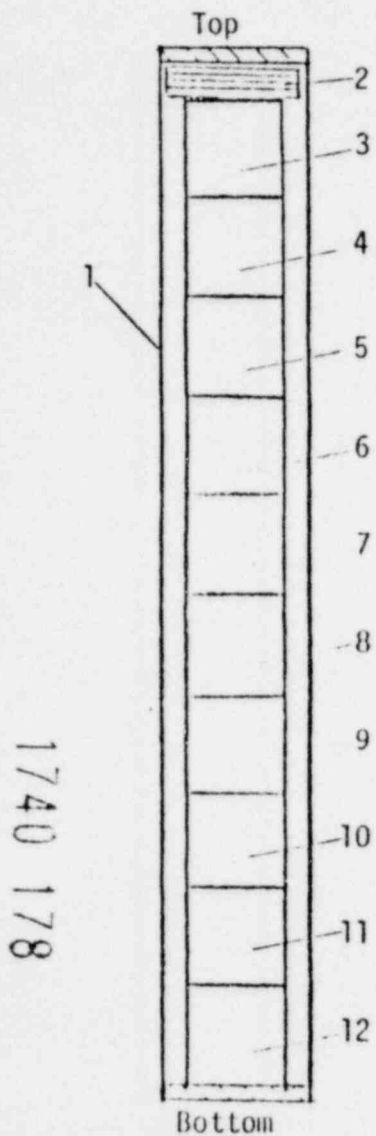
FL-10-i Serial Number: RL088

Inner Canister Number: 3

Total Weight PuO₂: 3,200 Grams

Total Weight Pu: 2,736 Grams

Total Decay Heat Load: 28.5 Watts

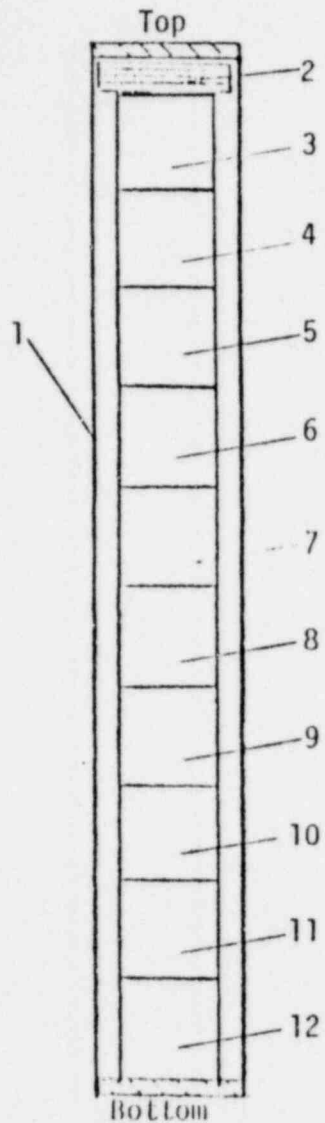


Item	Description	Contents	Identification
1	Inner Canister Assembly	10 Food Cans + Al Spacers	#3
2	Aluminum Spacer	As Required	N/A
3	Food Can	Empty	N/A
4	Food Can	800.0 Grams PuO ₂	Product Can #4
5	Food Can	Empty	N/A
6	Food Can	800.0 Grams PuO ₂	Product Can #2
7	Food Can	Empty	N/A
8	Food Can	800.0 Grams PuO ₂	Product Can #3
9	Food Can	Empty	N/A
10	Food Can	800.0 Grams PuO ₂	Product Can #1
11	Food Can	Empty	N/A
12	Food Can	Empty	N/A

FIGURE 2

INNER CANISTER LOADING PATTERN

FL-10-1 Serial Number: RL067
 Inner Canister Number: 4
 Total Weight PuO₂: 3,300 Grams
 Total Weight Pu: 2,831 Grams
 Total Decay Heat Load: 29.2 Watts



Item	Description	Contents	Identification
1	Inner Canister Assembly	10 Food Cans + Al Spacers	#4
2	Aluminum Spacer	As Required	N/A
3	Food Can	Empty	N/A
4	Food Can	800.0 Grams PuO ₂	Product Can #8
5	Food Can	Empty	N/A
6	Food Can	800.0 Grams PuO ₂	Product Can #6
7	Food Can	Empty	N/A
8	Food Can	900.0 Grams PuO ₂	Product Can #7
9	Food Can	Empty	N/A
10	Food Can	800.0 Grams PuO ₂	Product Can #5
11	Food Can	Empty	N/A
12	Food Can	Empty	N/A

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FIGURE 3

INNER CANISTER LOADING PATTERN

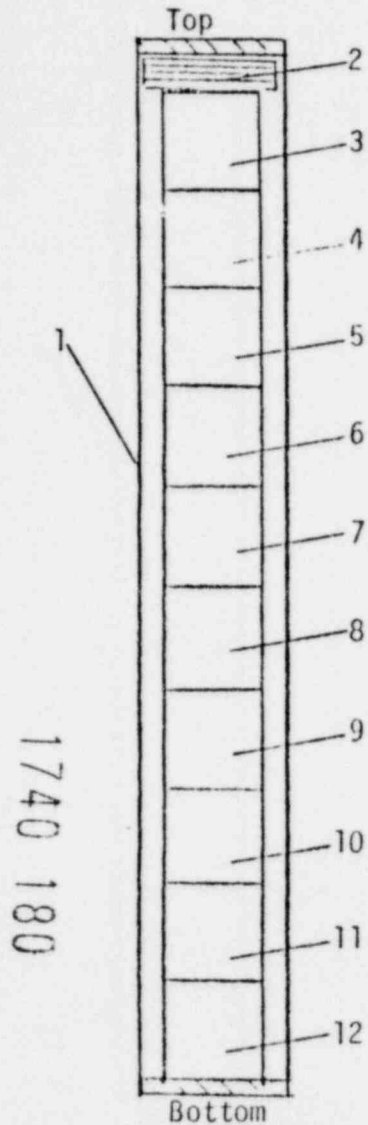
FL-10-1 Serial Number: RL061

Inner Canister Number: 5

Total Weight PuO₂: 2,823 Grams

Total Weight Pu: 2,414 Grams

Total Decay Heat Load: 25.1 Watts

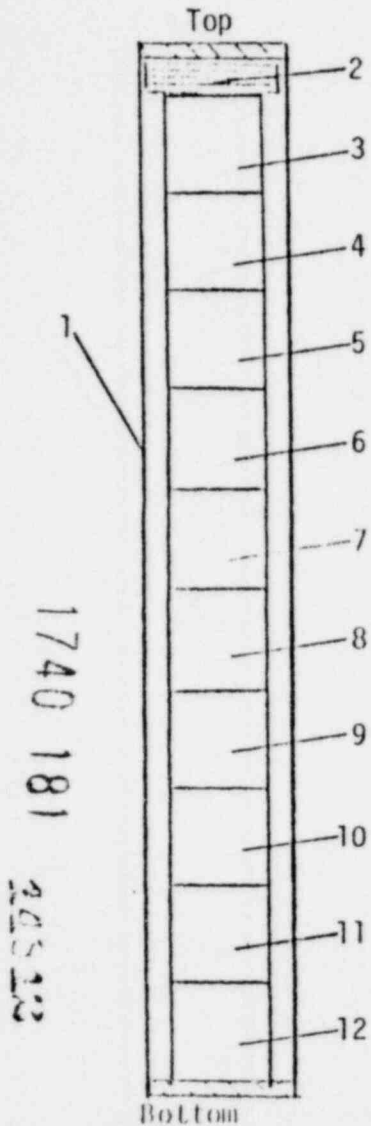


Item	Description	Contents	Identification
1	Inner Canister Assembly	10 Food Cans + Al Spacers	#5
2	Aluminum Spacer	As Required	N/A
3	Food Can	Empty	N/A
4	Food Can	423.2 Grams PuO ₂	Product Can #12
5	Food Can	Empty	N/A
6	Food Can	800.0 Grams PuO ₂	Product Can #11
7	Food Can	Empty	N/A
8	Food Can	800.0 Grams PuO ₂	Product Can #10
9	Food Can	Empty	N/A
10	Food Can	800.0 Grams PuO ₂	Product Can #9
11	Food Can	Empty	N/A
12	Food Can	Empty	N/A

FIGURE 4

INNER CANISTER LOADING PATTERN

FL-10-1 Serial Number: RL070
 Inner Canister Number: 6
 Total Weight PuO₂: 4,704 Grams
 Total Weight Pu: 3,995 Grams
 Total Decay Heat Load: 10.5 Watts



Item	Description	Contents	Identification
1	Inner Canister Assembly	10 Food Cans + Al Spacers	#6
2	Aluminum Spacer	As Required	N/A
3	Food Can	Empty	N/A
4	Food Can	Empty	N/A
5	Food Can	324.7 Grams PuO ₂	Product Can #5
6	Food Can	1,066.6 Grams PuO ₂	Product Can #4
7	Food Can	1,104.2 Grams PuO ₂	Product Can #3
8	Food Can	1,102.5 Grams PuO ₂	Product Can #2
9	Food Can	1,105.9 Grams PuO ₂	Product Can #1
10	Food Can	Empty	N/A
11	Food Can	Empty	N/A
12	Food Can	Empty	N/A